VERMILION RIVER TMDL FOR SULFATE

SUBSEGMENTS 060801 & 060802

US EPA Region 6

With cooperation from the
Louisiana Department of Environmental Quality
Office of Environmental Assessment
Environmental Technology Division

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources for the pollutant of concern and nonpoint sources discharging to the waterbody. A TMDL has been developed for the Vermilion River. Sulfate is monitored as an indicator for the protection of fish and wildlife propagation use designation.

The Vermilion River, subsegment 060801 flows from its headwaters to Bayou Fusilier – Bourbeaux Junction to New Flanders (Ambassador Caffery) Bridge at Highway 3073. Subsegment 060802 flows from the New Flanders (Ambassador Caffery) Bridge at Highway 3073 to the Intercoastal Waterway. The Vermilion River, subsegments 060801 and 060802 were both listed on the October 28, 1999 Court Ordered §303(d) List as not fully supporting the water quality standard for propagation of fish and wildlife. Louisiana's water quality standards for chloride, sulfate, and TDS are applied as follows:

> "Numerical criteria for these parameters generally represent the arithmetic mean of existing data from the nearest sampling location plus three standard deviations. For estuarine and coastal marine waters subsegments in Table 3 that have no listed criteria (i.e., designated N/A), criteria will be established on a case-by-case basis using field determination of ambient conditions and the designated uses. For water bodies not specifically listed in the Numerical Criteria and Designated Table, increases over background levels of chloride, sulfate, and TDS may be permitted. Such increases will be permitted at the discretion of the office on a case-by-case basis and shall not cause in-stream concentrations to exceed 250, 250, and 500 mg/l for chloride, sulfate, and TDS, respectively, except where a use attainability analysis indicates that higher levels will not affect the designated uses. In permitting such increases, the office shall consider their potential effects on resident biota and downstream water bodies in addition to the background conditions. Under no circumstances shall an allowed increase over background conditions cause any numerical criteria to be exceeded in any listed water body or any other general or numerical criteria to be exceeded in either listed or unlisted water bodies."

LDEQ monitoring data was assessed for the Vermilion River, subsegments 060801 and 060802, to determine if the propagation of fish and wildlife use was being maintained. Analysis of the data shows that the propagation of fish and wildlife use is not protected. Greater than 30% of the measurements exceeded the sulfate criterion of 35mg/l (see Appendix B, stations 0677). Therefore, a TMDL has been developed for sulfate.

For the purpose of calculating current sulfate loading on subsegments 060801 and 060802, the average sulfate concentration was calculated using monitoring data from LDEQ station 0677. In subsegments 060801 and 060802, the average sulfate concentration was 42.03 mg/l over the collection period (June 17, 1998 through November 17, 1998).

For the purpose of TMDL development, the State criterion of 35 mg/l was applied. The sulfate TMDL was developed based on simple dilution calculations using average flow and the state sulfate standard of 35 mg/l. The TMDL calculation includes a wasteload allocation, a load allocation, and a margin of safety. A 16.7% reduction in sulfate loading will be needed to meet the standard for the propagation of fish and wildlife.

1. Introduction

The Vermilion River, subsegments 060801 and 060802 were listed on the October 28, 1999 Court Ordered §303(d) List as not fully supporting the water quality standard for propagation of fish and wildlife. A TMDL for sulfate was developed in accordance with the requirements of Section 303 of the Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

2. Study Area Description

2.1 General Information

Water quality subsegments 060801 and 060802 are part of the Vermilion-Teche River Basin. The Basin encompasses the prairie region of the state and a section of the coastal zone. The Vermilion River is located in southwestern Louisiana in the Vermillion-Teche River Basin. The Vermilion-Teche River Basin is bounded on the north by the Red River Basin, on the east by the Atchafalaya Basin, on the west by the Mermentau River Basin and southward by the Gulf of Mexico. Land use in the Vermilion-Teche Basin is largely agriculture, the primary crops being soybeans, surgarcane and rice. The average annual rainfall in the vicinity of the Vermilion River is approximately 58.36 inches. The area is sparsely populated outside its small municipalities and land use is dominated by agriculture. The land uses for segment 0608 of the Vermilion River watershed are summarized in Table 1 (LDEQ, 1993).

Table 1. Land Uses in segment 0608

LAND USE TYPE	NUMBER OF ACRES	% OF TOTAL AREA
Urban	38,559	9.7
Agricultural	310,281	77.7
Forest Land	30,268	7.6
Water	2,816	0.7
Wetland	14,832	3.7
Barren land	728	0.2

2.2 Water Quality Standards

The designated uses for the Vermilion River, subsegments 060801 and 060802 include primary contact recreation, secondary contact recreation, propagation of fish and wildlife, and agriculture. Sulfate is a water quality criterion used for assessment of use support. Louisiana's water quality standard for sulfate is 35 mg/l (subsegments 060801 & 060802).

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of the Vermilion River are unknown sources (LDEQ, 1998). Additional suspected sources listed in the Court Ordered 1999 303(d) list include industrial point sources, municipal point sources, package plants (small flows), agriculture, and irrigated/non-irrigated crop production.

2.3.1 Point Sources

Point sources of sulfates include sewage treatment plants, septic systems, and industrial discharges such as tanneries, pulp mills, and textile mills. There are known flows for 139 facilities discharging sanitary wastewater into subsegments 060801 and 060802 of the Vermilion River. The combined flow of all these dischargers is 47.69 cfs (see Appendix A).

2.3.2 Nonpoint Sources

Sulfates (SO4--) can be naturally occurring or the result of municipal or industrial discharges. When naturally occurring, they are often the result of the breakdown of leaves that fall into a stream, of water passing through rock or soil containing gypsum and other common minerals, or of atmospheric deposition. Runoff from fertilized agricultural lands may also contribute sulfates to water bodies. (LDEQ, 1993)

3. TMDL Load Calculations

3.1 Current Load Evaluation

Sulfate loads have been calculated using the instream sulfate concentration and the flow of the stream. The following equation can be used to calculate sulfate loads.

Equation 1. C x Q in cfs x 5.39 or C x Q in MGD x 8.34

Where: C = concentration in mg/l
Q = stream flow in cfs or MGD

A traditional expression of the loading may be developed by setting one critical or representative flow and concentration, and calculating the sulfate load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use.

For the purpose of calculating current loading on the combined subsegments, the average sulfate concentration was calculated using LDEQ monitoring data from subsegments 060801 and 060802. Based on a period of record from June 17, 1998 through November 17, 1998 at monitoring station 0677, the average sulfate concentration for subsegments 060801 and 060802 was 42.03 mg/l (see Appendix B). In addition, the average flow for these subsegments is 750 ft^3/sec (see Appendix C). Using these values and Equation 1 it is estimated that the current loading is:

Current load = 42.03 mg/l * 750 cfs * 5.39 = 169,906.28 lb/day.

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 (or Harmonic mean flow) at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. The load reduction needed to meet the water quality standard for propagation of fish and wildlife in subsegments 060801 & 060802 at 750 cfs is 28,418.48 lb/day (16.7% reduction). This was obtained by calculating the allowable TMDL at 750 cfs for the 35mg/l criterion (141,487.80 lb/day) and subtracting this load from the observed load (169,906.28 lb/day).

TMDL= Cstd x Q cfs x 5.39, where Cstd= 35mg/l, Q=750cfs

TMDL= 35mg/l x 750cfs x 5.39 = 141,487.8 lb/day

Current Load - TMDL = Load Reduction

169,906.28 lb/day – 141,487.80 lb/day = 28,418.48 lb/day

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater to maintain an in-stream sulfate concentration of 35 mg/l (subsegments 060801 , 060802). Point source dischargers located in this watershed have a total adjusted design flow of 47.69 cfs (see Appendix A). Thus, calculation of the WLA gives:

WLA = Cstd * Qe * 5.39, where Cstd = 35 mg/l and Qe= 47.69 cfs

WLA = 35.0 * 47.69 * 5.39 = 8996.72 lb/day

3.4 Load Allocation (LA)

The load allocation at a given flow can be calculated using Equation 1 and the following relationship:

(TMDL@ given flow and criterion) - (WLA) = LA

LA for instream flow of 750 cfs = 132,491.08 lb/day

141,487.8 lb/day (TMDL@ 750 cfs) – 8996.72 lb/day (WLA) = 132,491.08 lb/day

3.5 Seasonal Variability

Louisiana's water quality standard for sulfate is for January through December. Therefore, no seasonal TMDL for sulfate was developed.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for sulfate, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average flows to calculate current loading to obtain load reduction.
- Treating sulfate as a conservative pollutant, that is, a pollutant that does not degrade in the environment.
- Using the sulfate water quality standard of 35 mg/l as established by Louisiana water quality standards rather than using site-specific criteria and seasonal variability factors.
- Using the design flow (where available) of the point source dischargers rather than actual average flow rates, which are typically much lower.

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the

effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) (LDEQ, 1996) (LDEQ, 1998) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

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LDEQ, 1996. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, La.

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APPENDIX A Dischargers to Vermilion River

Subsegments 060801 and 060802 (Aguillard, 1999)

Item #	Discharger Name	Permit Number	Design Flow (cfs)	WLA (lbs/sulfate/day)
1	Town of Sunset	LA0038628	0.464	87.53
2	Grand Couteau Oxidation Pond		0.252	47.54
3	Beau Chene High School		0.031	5.85
4	Town of Arnaudville	LA0046639	0.402	75.84
5	Carencro Village Sub.-ATS		0.067	12.64
6	Trewhill Subdivision - ATS		0.047	8.87
7	Grand Stakes Sub. - ATS		0.070	13.21
8	Country Square Sub. - ATS		0.041	7.73
9	Highland Acres Sub. - ATS		0.025	4.72
10	La Place Maison Sub.		0.024	4.53
11	Windy Acres Sub. - ATS		0.037	6.98
12	Cajun Village Sub. - ATS		0.040	7.55
13	Carencro North Sub. - ATS		0.024	4.53
14	Deer Park Sub. - ATS		0.045	8.49
15	Hackberry Place Sub. - ATS		0.051	9.62
16	Carencro Facility - MES AMI MHP		0.018	3.40
17	Lexington Heights		0.035	6.60
18	Bois Bechet Sub.		0.038	7.17
19	Young Acres Sub. - ATS		0.027	5.09
20	Armand Atreet Oxidation Pond		0.774	146.02
21	Magnolia Farms Sub. - ATS		0.045	8.49
22	Magnolia Woods Sub. - ATS		0.027	5.09
23	Magnolia Hills Sub. STP-ATS		0.039	7.36
24	Indian Hills MHP		0.010	1.89
25	NE Oxidation Pond, Lafayette	LA0036391	2.321	437.86
26	Victoria Village Sub. - ATS		0.139	26.22
27	Lakeview Estates Bus.- ATS		0.076	14.34
28	Bayou Wilderness RV Resort		0.024	4.53
29	River Oaks Country Estates		0.037	6.98
30	Nottingham Sub. - ATS		0.044	8.30
31	LA. Dept. of Trans. & Dev. Lafayette		0.015	2.83
32	Kings Court MHP	WP0523	0.028	5.28
33	Bellemont Estates Sub.	LA0055697	0.058	10.94
34	Evangeline Trailer Park		0.019	3.58
35	Conque's MHP		0.018	3.40
36	Manola STP - Town of Carencro		0.860	162.24
37	Derby Heights Sub. - ATS		0.051	9.62

38	Broussard, Town of		1.160	218.83
39	Letriomphe Golf Club 7 Sub.		0.309	58.29
40	Quiet Village MHP		0.037	6.98
41	East Wastewater Treatment Plant		6.189	1167.55
42	Park 90 Establishment - ATS		0.017	3.21
43	Queens Row MHP		0.053	10.00
44	Markridge Sub.		0.054	10.19
45	Country Pines MHP		0.034	6.41
46	Cypress MHP		0.073	13.77
47	G and R MHP		0.026	4.90
48	Melanie Rose MHP		0.016	3.02
49	Mouton Estates Sub. - ATS		0.046	8.68
50	Shiloh Place Trailer Park		0.031	5.85
51	Avanti Sub.		0.040	7.55
52	Ossun Heights Sub. - ATS		0.111	20.94
53	Royalton Park Sub. - ATS		0.051	9.62
54	Derrick Equipment Co.		0.039	7.36
55	Ossun Elementary School		0.018	3.40
56	Victoria Village	LA0055719	0.024	4.53
57	South Wastewater Treatment Plant		10.831	2043.27
58	Ambassador Caffery Plant		9.284	1751.43
59	L.O. Peck/East Bayou Oaks Sub.		0.018	3.40
60	Coaches Plaza Apts. Sub.		0.019	3.58
61	Woodridge Sub. - ATS		0.020	3.77
62	Pecan Acres	LA0055573	0.038	7.17
63	Oak Trace Sub. - ATS		0.916	172.80
64	Stanford Place Apts.		0.020	3.77
65	Café Tee George		0.039	7.36
66	Acadiana Trestment Systems, Inc.		0.078	14.71
67	River Green Sub. - ATS		0.066	12.45
68	Coach House Manor Sub.		0.095	17.92
69	Fairway Village Sub. - ATS		0.102	19.24
70	Holiday MHP		0.037	6.98
71	Holiday Meadows Estates		0.043	8.11
72	Sandest Terrace Place Sub.		0.057	10.75
73	Clearview Estates Sub. - ATS		0.076	14.34
74	Country Lane Apts. - ATS		0.056	10.56
75	Hernandez Heights Sub. - ATS		0.024	4.53
76	Sandest Plaza Sub. - ATS		0.039	7.36
77	Sara Dee Park Subd. - ATS		0.076	14.34
78	Quail Hollow/LA Vil Sub. - ATS		0.192	36.22
79	Avies Knoll Sub.	LA0062987	0.135	25.47

80	Green Meadows Sub. - ATS		0.055	10.38
81	Shadowwood Sub. - ATS		0.059	11.13
82	Lakeside Village Sub. - ATS		0.032	6.04
83	Holiday Laneuvelle Sub.		0.155	29.24
84	Brambles MHV		0.017	3.21
85	Chelsea Ridge Sub. - ATS		0.021	3.96
86	Arrowhead Sub.		0.047	8.87
87	Riverwood Sub. - ATS		0.097	18.30
88	Charleston Place Sub.		0.079	14.90
89	Frenchmen's Creek Sub. - ATS		0.109	20.56
90	Fox Run Sub. - ATS		0.040	7.55
91	Potpourri Village		0.087	16.41
92	Oakshire Wimbleton Sub. - ATS		0.050	9.43
93	Jackson Square/Pontalba Sub. - ATS		0.205	38.67
94	Ile Des Cannes/Champions/West		0.481	90.74
95	Oregon Trail Sub. - ATS		0.028	5.28
96	Lafayette Investment Properties		0.031	5.85
97	Country Corner MHP		0.011	2.08
98	Village Quest Sub.		0.017	3.21
99	Country Aire Mobile Estates		0.066	12.45
100	Landall Mobile Estates		0.066	12.45
101	Town of the Scott	LA0034495	1.160	218.83
102	Carroll Ann MHP		0.049	9.24
103	Southfield Square		0.072	13.58
104	Hummingbird Plaza/Wolf Creek		0.053	10.00
105	Township South/Sharlo Sub. - ATS		0.078	14.71
106	Village Park Mobile Estates		0.021	3.96
107	Diamond Head Estates Sub.		0.062	11.70
108	Beau Champs Sub.		0.015	2.83
109	Cross Creek Sub.		0.049	9.24
110	Lancaster Estates Sub.		0.048	9.06
111	Sun Village Sub. - ATS		0.011	2.08
112	The Glade Sub. - ATS		0.103	19.43
113	Pecan Acres MHP		0.011	2.08
114	West Side Strip Sub. - ATS		0.017	3.21
115	Country Trails Sub.		0.037	6.98
116	Maurice Wastewater Treatment		0.102	19.24
117	Monticello Sub. - ATS		0.051	9.62
118	Lafayette Bayou Trace Partner		0.021	3.96
119	Victoria Acres		0.039	7.36
120	River Road Sub. - ATS		0.042	7.92
121	Country Place Apts.		0.010	1.89
122	Milton Elem School		0.018	3.40

123	Brookhollow Sub.	0.033	6.23
124	Flander's Gardens Sub.	0.062	11.70
125	Ray Heights Sub. - ATS	0.014	2.64
126	Twin Lakes Sub. - ATS	0.041	7.73
127	Country Meadows Sub.	0.105	19.81
128	Beau Parterre/Cypress Cove	0.072	13.58
129	Garden Heights Apts.	0.086	16.22
130	Habersham Sub.	0.019	3.58
131	Pinnacle Place	0.022	4.15
132	River Oaks MHP	0.013	2.45
133	Mobile Home Acres	0.032	6.04
134	Cypress Point Sub. - ATS	0.026	4.90
135	Rosehill Sub. - ATS	0.066	12.45
136	Chauvin's Trailer Park	0.035	6.60
137	Abbeville, City of - Sewer Plant	4.023	758.94
138	Port of Vermilion	0.077	14.53
139	Zapata Protein (From Seacoast)	2.230	420.69
Total		47.69	8996.72

APPENDIX B Sulfate data

Vermilion River North of Intracoastal City, Louisiana, Station 0677

This page last updated on: 08/06/00

DATE	TIME	DEPTH meters	ALKA-LINITY mg/l	HARD-NESS mg/l	TURB-IDITY NTU	COLOR PT-CO units	CHLOR-IDES mg/l	SULFATE mg/l	T.S.S. mg/l	T.D.S. mg/l	T.S. mg/l
11/17/98	1352	1.0	64.9	71.1	80.0	.	24.2	17.9	88.0	.	.
11/05/98	1317	1.0	93.0	113.0	55.0	.	27.4	37.5	59.0	.	.
10/21/98	1306	1.0	88.4	109.0	34.0	.	28.0	35.3	41.0	.	.
10/07/98	1238	1.0	61.0	72.7	110.0	.	26.2	23.4	84.0	.	.
09/16/98	1147	1.0	.	.	21.0	.	38.3	9.0	13.0	.	.
09/02/98	1130	1.0	.	.	28.0	.	272.0	61.0	31.0	.	.
08/19/98	1142	1.0	.	.	70.0	.	34.5	26.7	72.0	.	.
08/05/98	1132	1.0	.	.	28.0	.	729.0	124.0	24.0	.	.
07/22/98	1048	1.0	.	.	85.0	.	149.0	42.0	84.0	.	.
07/08/98	1051	1.0	.	.	70.0	.	91.0	34.6	70.0	.	.
06/17/98	1059	1.0	.	.	45.0	.	56.5	50.9	47.0	.	.

The sulfate criterion (35mg/l) was exceeded in 55% of the samples (6 of 11) from June 1998 through November 1998.

Data Source: http://www.deq.state.la.us/surveillance/wqdata/0677wqng.txt

APPENDIX C Flow Information

Note: *The* "average streamflow" is defined to be the annual average streamflow.

Vermilion River at Perry (DEQ 001) – Based on DEQ determinations for Vermilion River at Surrey Street in Lafayette using USGS data for the period 94-97, the average flow for the Vermilion River at Perry is about 750 CFS. For May-October, the average flow is estimated to be about 600 CFS; for November- April, the average flow is estimated to be about 900 CFS.